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THE FOOD OF BELGIUM

VERNON KELLOGG

The Food Administration asks that we be as careful and economical of food as we can; that we modify our food habits in some little measure in order to increase the quantity of wheat, meat, and sugar that can be sent overseas. It asks for nothing in the way of real deprivation or sacrifice. Most of us are doing what it asks. But how little it is when we compare it with what some other people are doing.

Part of our food-savings goes to Belgium. For three and a half years America has helped to keep Belgium alive. It has sent, with whatever regularity has been possible, the wheat, rice, dried peas and beans, lard and bacon that furnish the daily ration for the ten million unfortunates in Belgium and occupied France. And this daily ration! What a ration it is; a piece of war bread, a little rice, dried peas and beans, a microscopic portion of bacon and another of lard, a scant allowance of condensed milk and a little burned grain to take the place of coffee. And this same ration day after day, over and over again.

One-half the people of Belgium today receive a part or all of their daily food from charity. Over a million and a half get their food by standing each day in the long soup lines in front of communal kitchens. Whenever our food shipments decrease, these soup lines increase, because when there is a shortage of food in Belgium, the soup lines and the children's canteens are the first to be cared for. In one month, the soup lines of proud old Antwerp increased from 40,000 to 150,000. That meant that every other man, woman, and child in that great city had to rely on the soup lines for daily bread.

Isolated from the rest of the world, cut off from news of their own soldiers at the front, assaulted physically and tortured mentally by their

utterly cruel oppressors and slave drivers, they have yet maintained a spiritual resistance and, wherever possible in the face of machine guns at street heads and in open places, a physical resistance to the Germans. Theirs has been the real trial and the real sacrifice. Not the least part of this trial and sacrifice has been in connection with their lack of food.

Shall we now, because our experience in the war is beginning, forget their long experience, with its ever increasing hardship and privation? It has not been difficult for us to spare for Belgium the food that it has needed, but with the growing demands on us for the other Allies, and the needs of our own army overseas, it is becoming more difficult for us to maintain the Belgian shipments. This growing difficulty must in no way lessen our giving. We must meet it—and we can easily meet it—by making the beginning of a sacrifice on our own part. What was before so easy that we could not notice it in our own living is now becoming a duty and privilege which we can in some slight measure personally feel. There is no question for us of the semi-starvation that has been the actual condition of the Belgians for three and one-half years. There is no question even of real hardship, nor of the least injury to health or impairment to strength. There is only the question now of a slight sacrifice of taste and of convenience. But we must make this slight sacrifice if the Belgians are to be kept alive, and the Italians, the French, and the English are to be enabled to carry on the war.

We should be glad of our opportunity. These other peoples have already fought for us too long, but they must keep on fighting. In order to do this, however, they rely on us absolutely for their food supply. To meet that obligation of ours is the real reason for our government food control, our Food Administration. All the suggestions, all the regulations made by the Food Administration have one end in view—that we shall continue, even in the face of increasing difficulties, to maintain the food supply of the fighting Allies, and keep the Belgians, as we have literally kept them so far, from starvation. If we could but once visualize the situation of those long-suffering people, we should insist upon putting ourselves beside them, not only with heart and soul and army and navy, but as companions in hardship and sacrifice; we should insist that we share and share alike. I am almost glad that the food situation is becoming more difficult, because as we feel it more, we shall do better and better. All we need is truly to realize the situation in order to meet it. That realization is beginning.

TEACHING FOOD VALUES[1]

C. F. LANGWORTHY

United States Department of Agriculture, Washington, D. C.

At such a time as this, when food problems are of the greatest importance in connection with the War Emergency situation and when we must make every effort to stretch our food supply to meet military needs and the needs of the civilian population in the United States and allied countries, it is well that we should take stock of our knowledge of foods and food values to see what we have and how we can best make use of it.

Besides an instinctive recognition of the need for variety in the diet, we have a great store of empirical knowledge as to how to gather food, how to grow it, how to make an unpromising raw material into a usable foodstuff, how to cook food so as to develop its good qualities, and how to combine different kinds into palatable and nourishing meals. We have also an understanding, even though we do not always act upon it, of the importance of moderation in eating, and we recognize that a continuing sense of well-being, health, and vigor is one proof that we are rightly fed.

For such knowledge we have to thank the countless generations of men and women who have learned in the school of experience and passed on what they have learned. We have also to thank the thinker who has pondered on these things which pertain to our daily life and drawn conclusions for our guidance. Out of this thinking has come the laboratory method, old in its beginnings and very greatly developed in the last few decades, which enables us to test the worth of theories and to accumulate carefully tested data.

The research method has enabled us to know the structure, operation, and fuel requirements of the body machine and has just lately shown us that mineral and protein building material and energy are not enough but that we must have in addition two other substances essential for normal body growth and maintenance, which we frankly refer to as the "unknowns," because we do not know as yet the nature of something whose existence has been demonstrated.

[1] Presented at the Tenth Annual Meeting of the American Home Economics Association, Atlantic City, March, 1918.

Taking stock of what we have naturally raises the question as to whether or not we can more effectively apply the existing information to insure a more satisfactory use of food resources and provide a diet adequate for normal body development and maintenance. All will agree that there is a general willingness to learn, that there is much to teach, and that there are highly developed methods for giving instruction. In proof we have only to think of the great development of formal home economics teaching in the last fifty years, the great popular interest in the subject, and the efforts which are being made to meet a popular demand by extension teaching and in other ways. Through the efforts of the Government, the American Home Economics Association, and other agencies, home economics, of which food is so important a part, has been systematically classified in pedagogical form, and it has been shown that in truth home economics is, to quote a definition, "the *organized* body of knowledge which treats of food, clothing, shelter, and household management in their physical, economic, and social aspects as related to the life and welfare of the individual, the family, and the community."

Though no one would claim that the ideal had yet been reached, it can be justly claimed that professional teaching in home economics—and one might more truly say in food than in any other of the subdivisions—is being successfully carried out. There are well established and well arranged courses of instruction for teachers, professional and vocational needs, and also courses arranged to form a part of general cultural education. To meet the demands of teacher and student, subject matter has accumulated rapidly in the form of government and state documents, text-books, reference books, and so on, and also in popular generalizations and discussions.

In the matter of food and dietetics, general information is available and is being widely disseminated regarding production, handling, marketing, and preparation of food for the table, and a terminology known only in the laboratory a few years ago is becoming common in the public press and in conversation. Indeed it is comparatively easy to give much information on food and its uses and to give it in a form which is readily understood and generally acceptable.

In considering the matter one must not overlook the great demand which exists now, as it always has, for generalization and "rules of living," a demand coming largely from those who have had neither time nor opportunity for even a limited amount of special training in food and its use but who have a right to know, if it is possible to tell them,

how to select foods wisely, how to prepare them acceptably, and how to combine them into adequate meals. It surely behooves home economics workers to meet this need and not leave the field to the ignorant and to the exploiter whose fantastic statements and claims, which may seem to many as reasonable as would the scientific facts, are only too often presented in language which he can understand and with a specious authority which a reader or a hearer accepts without question. To do its part, home economics must fully appreciate the need for simple and definite instruction and must itself make generalizations and lay down its "rules of living" always with an honesty of purpose which recognizes that rules are only attempts to express truth and that they must be modified as knowledge accumulates.

A study of the meals of families whose health and general body maintenance indicate that they are well fed, shows that though food materials differ widely the world over, there is nevertheless a uniformity when one takes into account the chemical substance which the foods supply and the amounts of the food constituents the body obtains. In the same way a study of the composition of foods and the ways that they are used in the diet shows that varied as they are they may be grouped in a way which will indicate both similarities and differences in food value and consequently in dietetic use. To be useful as a basis for popular instruction in food values, such grouping must be simple, easily understood, and of a sort which can be readily used. Like all such generalizations it must accord with common experience and common sense. The generalization which the Department of Agriculture has made—and the Department has profited by the many attempts at food grouping which others have proposed—divides the available food supply into five groups: The first is made up of fruits and vegetables, the second of milk, eggs, meat, meat substitutes, and meat savers, the third of cereal foods and their products, the fourth of sugars and other sweet foods, and the fifth of fats and fatty foods. The first group supplies mineral building material in a proportion large in comparison with its energy value. The second group supplies in its protein, in a proportion large as compared to its energy value, nitrogen in the right form for body-building material. The fourth group supplies little except body fuel in a quickly available form. The fifth group is like the fourth, an energy-yielding group, but is set apart because the amount of energy supplied per unit weight of fat is so much greater than that supplied by a unit weight in any other group. Between the first two and the last two groups comes group three, the cereal foods and their products,

which truly is a "middle group" in that the cereal foods share the properties of the groups which precede and those which follow, being valuable sources of mineral and nitrogenous body-building materials and also important sources of energy. When one thinks of this it is easy to understand the reliance that mankind places on this group and to see why bread has been so generally looked upon as the staff of life.

In arranging the foods under the several group headings, the lists may be long or short and each list may or may not be subdivided to bring out the differences in its members. Very commonly in popular teaching a short list, without any special attempt to subdivide the members of each group, is to be preferred since too much detail often hinders rather than helps one to grasp the main point which is after all simple and easy to understand, remember, and apply—namely, that foods are different, and that the diet must contain the different kinds.

The grouping of foods can be simplified or can be elaborated as seems best under given circumstances.

*The five food groups**

Group I *Fruits and vegetables.* Important sources of mineral substances.	Group II *Milk, meat, meat substitutes, meat savers.* Sources of protein.	Group III *Cereals and their products.* Starchy foods. Valuable sources of energy and protein.	Group IV *Sugar, sugar substitutes and savers.* Supply energy in readily available form.	Group V *Fats and fatty foods.* Supply much energy.
Vegetables	Milk	*Grains*	*Sugars*	*Fats*
Spinach	Cheese	Wheat	Cane sugar	Butter
Lettuce	Eggs	Rye	Beet sugar	Cream
Cabbage	*Meat*	Corn	Maple sugar	Lard
Celery, etc.	Beef	Rice	Milk sugar	Drippings
Salsify	Mutton	Oats	*Sugar substitutes*	Seed oils
Potatoes	Pork	Barley	Molasses	Nut oils, etc.
Carrots	Veal, etc.	Grain sorghums	Honey	*Fat-rich foods*
Onions, etc.	*Meat substitutes*	Buckwheat, etc.	Glucose	Fat pork
String beans	Fish	*Grain products*	Corn sirup, etc.	Bacon
Green peas	Oysters	Flours	*Sugar rich foods*	Suet
Green corn	Clams and other sea food	Meals	Sweet fruits, fresh and dried	Oily nuts, etc.
Okra, etc.	Some legumes	Cereal breakfast foods	Jams	
Fruits	*Other protein rich foods*	Macaroni, etc.	Preserves	
Apples	Beans		Candy, etc.	
Plums	Peas and most other legumes			
Grapes	Nuts			
Oranges				
Berries, etc.				

* Though essentially the same, this classification differs somewhat from that published earlier. Sci. Mo., 2 (1916), p. 294.

In using such a table, and it may be made to include local as well as general food products, the first thing for beginners is to learn the name of the groups and the members of each group, and it is hardly possible to do this without realizing that foods are different and that the groups bring like kinds together. When one seeks reasons for the grouping it should be made clear that building material characterizes the first two groups and fuel value the last two groups, the middle group being the meeting ground of these characteristics. Though obviously this classification of foods is based upon their characteristics (1) as building and repair material and (2) as body fuel, some discussion may arise as to why a given food should be included in one group instead of another. For instance, the potato is recognized as a starchy food—why not put it in Group III with other starchy foods? For one reason because its common use is as a vegetable; for another, because one is more likely to overlook its value as a source of mineral building material than its value as a starchy food. One can point out, however, that if there is a shortage of starch-yielding cereal, potato can be used in place of it, becoming a temporary member of Group III.

So far as it goes the classification is in accord with facts and is consistent and forms part of a definite plan for making food facts plain. It shows a number of relations and makes the discussion of many matters easy. It is not claimed that it does all that is desirable. A classification which would also bring together the foods which are the chief sources of the two unknown constituents, Fat-soluble A and Water-soluble B, would be convenient but this does not seem feasible until we have a more definite knowledge of these constituents and their relation to those whose uses for body building and body fuel we know more about. However, one can discuss these constituents on the basis of the present classification. For instance, it can be pointed out that Fat-soluble A is found conspicuously in certain members of Group I, Group II, and Group V. The relation of the green leaf vegetables of Group I to the presence of unknown A in certain members of Group II (milk, egg yolk, and meat), and Group V (butter, cream, suet), which come from animals which live on green forage crops, offers an opportunity to discuss many problems pertaining to the value of foods in nutrition.

As regards water-soluble B, one can point out that though it may occur in some members of all the groups, it is characteristic of the green portions of plants or other actively growing portions, and that it accumulates in the body of animals, particularly those which directly live

upon such parts of plants. The relation of milling, sugar refining, oil making, etc., to the presence or absence of mineral constituents, protein, and the "unknowns" is another matter which can be mentioned and naturally leads up to the discussion of the special value of some foods. It can be pointed out, for instance, that milk, a "natural" food, is almost indispensable because of the Fat-soluble A it supplies, and the special value of its protein. It can be pointed out also that butter, a milk product, in addition to being an important energy food, contains Fat-soluble A. In discussing starch it can be pointed out that it is a carbohydrate food useful as a source of energy, while the grain or roots from which it is made, contain body-building material as well. One can go on to show how easily meals can be planned to include foods which meet all needs and how one food may be used to make good a deficiency in another; eggs, for instance, to supply protein deficient in a diet high in vegetables, fruits, and starchy foods. This will afford another illustration of the fact that to be satisfactory meals must be truly varied if they are to supply the needed body fuel and the building and repair materials, including the "unknown" essentials.

By considering such matters as these in relation to body needs, it becomes apparent that diets which are conceded to be adequate or truly balanced contain representatives of all five groups. One may reverse the statement and truthfully say that a diet in which all the five groups are reasonably well represented will meet the food requirement of the body.

It need hardly be said that there is no thought that such a generalization as the food grouping suggested should be used to replace other methods of presenting the subject which have been tested and found good. It is the conviction that such a plan as this has a place with them and that it will prove useful under circumstances where a more technical presentation would not be readily understood or where it may serve as a convenient introduction to the more technical presentation.

In addition to publications of the Department of Agriculture which have already appeared, others are planned in which food selection, meal planning, and other problems are discussed on the basis of this food group generalization, together with charts and other illustrative material which help to make it clear that it is easily possible to plan meals which do meet the needed body requirements and also that it is only too easy, if one does not keep in mind this simple grouping—or something else which makes clear the likenesses and differences in foods—to plan meals

which are so unduly rich in body-building foods or energy-yielding foods that the diet is decidedly "unbalanced."

Knowing the food groups greatly simplifies the housekeeper's problem for she can think of her problems in terms of the foods which she knows rather than in the terms of the laboratory. The other members of the family can also understand the matter and see why, if they are to have a truly balanced diet, they should partake in reasonable amounts of all the foods which she has chosen and prepared for them. It is easy to see also that if one lives upon a diet very generous as regards carbohydrate foods, either starchy foods or sugar, or very generous as regards foods rich in fat, the diet will have a fuel value unduly high as compared with building material. If, on the other hand, our meals day after day are very generous with respect to meat and similar foods, the diet is almost sure to be deficient in mineral substances or in fuel value. Or again, it may be made plain that if green vegetables are generally left out of the diet because one may not happen to fancy them, there is a danger that too little of the mineral matter required for body building or of the unknown dietary substances will be supplied to meet the body needs.

The great value of milk as a food of which it is difficult to eat too much, the value of butter fat, of cheese, and of eggs, can be made clear as well as the varied usefulness of cereal grains and their products, and it can be shown why it is that we can depend so largely upon cereal foods,—and this means lowered cost,—provided one keeps the balance right by using reasonable proportions of other groups, particularly such foods as milk, eggs, vegetables and fruits.

Knowing the different foods and their relations to each other in the way proposed helps on the cost side of the problem also, for, since the idea is good representation of all the groups in the diet, one can see that this ideal can be attained very generally by using the cheaper members of a group in place of the more expensive. One can see also that members of one group can be used in place of those of another group under some circumstances, as bread or rice for potatoes, or the other way round. Such matters are easier to explain if one has learned to know the sorts of food there are and those there are of each sort.

The food group generalization presented is based upon an extended study of dietary and other data sufficient, it is believed, to warrant the conclusion that it is sound. That it is convenient for popular instruction seems clear from the results obtained by home economics workers who have been good enough to test the matter in their extension and

other teaching work. It has been a common experience to have a housekeeper say "This is something which I can understand and follow and which really helps me to plan my meals in a way which I can see must give my family what they need." Further, it has been found that this "food group" plan offers an easy way of introducing the subject of food and nutrition in more formal instruction and that it furnishes a convenient arrangement of pegs on which to hang a great many facts regarding food and its uses.

TEACHING FOOD VALUES[1]

ALICE F. BLOOD

Director, School of Household Economics, Simmons College, Boston

I should like to contribute five minutes of my time to the general discussion because the thing I am here to say can be said briefly. I am here neither to present a plan like that of Miss Hunt's, nor to report progress as Miss Creswell is able to do, but to express the state of mind of home economics teachers. I know that I speak for the teachers here when I say that we feel the same sense of responsibility for the instruction of the general public in the principles of nutrition that we feel for the instruction of the students in our immediate care, and that we feel it one of our first duties to arouse in our students a sense of responsibility to the community.

I am not in close touch with rural conditions but there has certainly never been a time in the city when it was so easy to get an audience for the discussion of food. How to reach everyone in a city is another matter. I am inclined to think that our best messengers are the people who already have an entrée into the home. We have in Boston an enthusiastic home missionary who earns his living selling Grade A milk. A short time ago I sent to his firm for some advertising literature and he was sent to bring it. We fell to talking about the educational needs of people and he fairly burst out, "You see I go to people's

[1] Part of the general discussion on How to Teach Food Values to the General Public, at the Tenth Annual Meeting of the American Home Economics Association, Atlantic City, March, 1918.

back doors and sometimes I arrive just as the woman is dishing up dinner. You haven't any idea of the dreadful cooking I see. There isn't a day goes by that I don't talk to some woman about her housekeeping and it isn't any of my business either." His instruction may not be as complete as we would like to have it but it at least has the advantage of reaching the woman who needs it most. I am convinced that if we are to reach great numbers of our city people we must do it indirectly through the people who go to the home on some other errand.

An effort in this direction has been made for a number of years by the Instructive District Nursing Association in Boston whose nurses are all trained in the principles of nutrition before they are sent into their districts. A similar plan is that to interest kindergarten teachers in the proper feeding of children.

Our first duty at this time is to carry, either directly or by proxy, the messages of the Food Administration but we shall be missing a great opportunity if we do not at the same time manage to teach a few of the most fundamental facts with reference to good cooking, judicious expenditure for food, and adequate nutrition.

Those who select their food solely with a view to economy as respects cost find in the literature concerning foods the information that the cheapest sources of both energy and protein are the cereal grains, and the legume seeds, peas and beans. Economic conditions are now such that rigid economy is necessary in the purchase of food, especially among city dwellers with small incomes. Unless the public is speedily educated regarding the necessity of employing regularly in the diet either an appropriate amount of milk or of the leafy vegetables, it seems certain that the time is not far distant when dietary errors now becoming common will become a still more important menace to the public health.—*E. V. McCollum and N. Simmonds, Jour. Biological Chemistry, February, 1918.*

THE UTILIZATION OF SOME NUTS AS FOOD[1]

LIEUT. FLORIAN A. CAJORI

Sanitary Corps, N. A.

The term "nut" as usually used in dietetics is not defined on a botanical classification but applies to those fruits in which the edible kernel or meat is surrounded by a harder covering or shell. With this broad and rather loose definition not only deciduous trees but legumes, conifers, plants of wide botanical difference contribute to the supply of what is spoken of as nuts.

Chemical analysis shows that the edible part of nuts holds an almost unique position among the food stuffs; it is highly concentrated, rich in protein, fat, and sometimes in carbohydrate, contains little refuse, and in these respects may surpass even such well recognized concentrated foods as cheese, eggs, meat, and cereals.

From the nutritive point of view nuts may be divided into two groups. The first, which embraces the largest variety of our available nuts, is characterized by its high content of protein and fat. Such nuts as the almond, peanut, pine nut, and Brazil nut, fall into this class. The other group, exemplified by the chestnut, coconut, and lichi nut, is of low protein and fat content, but richer in carbohydrate. The reader is referred to the publications of Jaffa (1903), Woods and Merrill (1899), and Street (1916) for a description of the various nuts and tables showing their composition.

Nuts and products made from nuts have long been used by man the world over as adjuncts to his diet. Among certain people and in certain localities this class of fruits, instead of being a mere supplement to an already complete dietary, has assumed a prominent place among the staple articles of food. Nevertheless, despite the fact, revealed by chemical analysis, that nuts offer a source of protein and fat in a concentration seen in no other class of foods, their use has, as a rule, been limited to that of a delicacy supplementing an already adequate diet. As Woods and Merrill (1899, p. 90) say in discussing the food value of nuts: "In view of their high nutritive value, the readiness and cheapness with which they may be prepared, it is a matter of some astonishment that they have received so little consideration as a food." The

[1] From the Sheffield Laboratory of Physiological Chemistry in Yale University, New Haven.

failure to eat them more extensively is doubtless due in part to the reputation for indigestibility that nuts have, and to the discomfort that often occurs after eating them at the close of a heavy meal. The study of the literature on the digestibility shows that there is no evidence to sustain this reputation for indigestibility that has empirically arisen. It must be admitted, however, that there are comparatively few metabolism experiments on record in which nuts made up a prominent part of the diet.

The earlier investigators who used nuts in their experimental diets were not primarily interested in the digestibility of nuts, but were studying the minimum protein requirement or the comparative value of vegetable versus animal protein; and they gave little indication as to the fate of the nuts included in their diets. Of the earlier papers those of Albu (1901) and Rumpf and Schumm (1899) are of interest as having a bearing on the digestibility of nuts. The most extensive experiments on record are those made by Jaffa in California (1901) (1903). His studies were conducted with fruitarians and nutarians who had lived for many years on a diet consisting mainly of nuts and fruits; and with a few university students who assumed the nutarian diet during the period of the experiments. The nuts used in Jaffa's diets were those commonly seen on American tables: the almond, English walnut, Brazil nut, pecan, and coconut. Jaffa's results, expressed as the conventional "coefficient of digestibility" of protein, ranged from 70 to 82 per cent on a diet of nuts and fruits, with an average of 75 per cent. On a mixed diet containing nuts he reports a protein utilization of 90 per cent. The average coefficient of protein digestibility for ninety-three metabolism experiments with young men on ordinary mixed diet has been computed by Atwater and Bryant (1899) as 93 per cent. A comparison of Jaffa's results with the average coefficient of digestibility on a mixed diet at once places the nut proteins—or properly speaking, the nitrogenous components—in a favorable light as highly nutritive foods.

Niles (1909) kept medical students on a diet of bread and fruit, along with pecans, peanuts, and Brazil nuts for several days and reported that his subjects at the end of the period seemed to be in "fit" condition with no intestinal disturbance when nuts were eaten as a staple part of the diet. However he did not make observations that would contribute facts to the actual digestibility of the nuts consumed. With the exception of Jaffa's extended studies on the digestibility of nuts there are no detailed experiments in the literature on the value of nuts as foods.

It seems desirable, especially at this time when, with the decreasing meat supply, the world's food resources must be extended, that more light be thrown on the real place that nuts may assume in the diet.

From the work of Langworthy and his co-workers (1917) on the digestibility of vegetable fats there is no reason to question the food value of the nut fats or to look on them as radically different in their physiological behavior from the other naturally occurring fats. We have therefore extended Jaffa's work and endeavored to determine if possible what factors influence the digestibility of nut proteins and carbohydrates.

PLAN OF THE EXPERIMENTS

The metabolism experiments were planned to study the utilization of the nitrogen in the case of the protein rich nuts, and of the carbohydrate and nitrogen of the chestnut, lichi nut, and coconut.

As Mendel and Fine[2] have pointed out in studies on the utilization of the proteins of the cereals, in addition to the relation to digestion that the protein under study may possess there are other factors which must be considered in utilization experiments. The texture of the food that contains the protein, as well as the presence of hemicelluloses or other indigestible substances that will give bulk to the intestinal content must be considered. The condition of the nuts, i.e., whether raw or cooked, the influence of moderate cooking, as when nuts are steamed and boiled, or the more extreme heating in roasting—these are factors that may influence the digestibility of nuts. For example, Saiki (1906) found that the starch of the raw chestnut was practically indigestible; yet cooked chestnuts are staple articles of the diet in many sections of the world. Merrill (1906) reports the utilization of the carbohydrates of cooked chestnut flour to be as good as that of wheat flour. It is customary in America to heat the peanut and often the almond before serving; while the pecan, English walnut, and pine nut are usually eaten raw. Nut butters and nut pastes are appearing on the market in increasing amounts. Is the nut served in this form more digestible, or is its nutritive value altered by this treatment? The experiments reported below were planned to try to answer some of the questions suggested above.

The diet experiments were conducted on dogs and on men[3]. The

[2] Mendel and Fine. Jour. Biol. Chem., 10, (1912), p. 303, p. 339.

[3] Through the courtesy of Dr. J. H. Kellogg of Battle Creek, Michigan, opportunity was afforded at the Battle Creek Sanitarium to carry out the experiments on men. The assistance received from Dr. Paul Roth, director of the Clinical Laboratories of the Sanitarium,

food intake was carefully observed, all foods being weighed as served and all uneaten portions weighed at the end of the meal. Only dishes whose composition was fairly uniform from day to day were admitted into the diet. The dietary was selected to insure an intake sufficient for the calorific needs of the subjects. The human subjects either maintained their body weight or gained somewhat during the progress of the trials. The urine was not examined. In the case of the dog urinary analysis indicated whether nitrogen balance was positive or negative. The feces of the different experimental periods were separated by means of lamp black or carmine in the usual manner. Sharp separation of the feces of the different periods was in all cases possible. Bone ash was added to the ration of the dog to insure a suitable bulk of feces and daily evacuation. The feces for each period were mixed with alcohol, oxalic acid added, and the whole evaporated to dryness on a water bath.

The various articles of the diet, the urine and the feces were analyzed for nitrogen and carbohydrate—nitrogen in all cases by a modified Kjeldahl method. The carbohydrates were determined as the soluble reducing sugars present after hydrolysis with 2 per cent hydrochloric acid. Hydrolysis was effected by boiling under a reflex condenser for two hours or by heating in an autoclave under twenty-five pounds of steam for half an hour. After cooling, the hydrolysis mixture was freed from protein decomposition products that might reduce Fehling's solution, by addition of 25 per cent phosphotungstic acid. After filtration and washing, the filtrate was neutralized, made up to volume, and the soluble sugars determined by means of the Allihn gravimetric method. The results are expressed in terms of glucose.

In the table the results have been grouped according to the character of the diet to show the range of nitrogen utilization on the various diets.

The utilization of the digestible carbohydrates in the control periods and on the diets containing the various nuts was so excellent and so nearly alike that detailed consideration here seems unnecessary.

DISCUSSION AND CONCLUSION

In expressing the results of digestion experiments as the "coefficient" of digestibility, one must carefully interpret the figures thus

who placed all the facilities of the laboratory at our disposal, and the constant help and advice in planning the diets that Miss Corinne King, chief dietitian of the Sanitarium, gave, are gratefully acknowledged.

obtained, and realize that these coefficients are not absolute values for any food that predominates in the diet. The presence of cellulose-containing foods that vary the bulk of the intestinal contents and other factors that increase or decrease the so-called metabolic nitrogen will change such a coefficient as we have used, based as it is on the ratio of the fecal nitrogen and food nitrogen alone. Even after using the available methods for determining the metabolic nitrogen of the feces or making calculations to correct for this fraction of the nitrogen output the coefficient of digestibility can hardly be regarded as an absolute value. However in a series of experimental periods, where the general character of the diet was fairly constant and where several observations were made on the same individual the use of the digestion coefficient enables useful if not absolutely defined comparisons to be drawn between different experimental diets.

Metabolism experiment on man. Summary of digestion trials. Coefficient of nitrogen utilization.

SUBJECT	BASAL	ALMOND	ALMOND PASTE	PEANUT	PEANUT PASTE	PECAN	PECAN PASTE	PINE	ENGLISH WALNUT	COCONUT	LICHI	BRAZIL
C.....	90	89	89			83		89			81	
C.....	90	89	88									
C.....	88											
C.....	86											
B.....	89	84	89	81		84					82	
B.....	87		88									
B.....	86											
B.....	86											
A.....	89			85	90		83			89		
A.....	85				90							
A.....	84											
G.....	90				92		81	89		87		
G.....	87				92							
G.....	85											
H.....	90	84							83			88
H.....	89											
Range.....	84–90	84–89	88–89	81–85	90–92	83–84	81–83	89	83	87–89	81–82	88

In general the proteins (i.e. nitrogenous components) and carbohydrates of the nuts studied were absorbed in large part; and in no case does the quantity of nitrogen or carbohydrate appearing in the feces indicate that these nuts are especially resistant to the digestive func-

tions of the alimentary canal. This conclusion is especially emphasized when the nuts are fed in a finely divided form as nut-paste or "butters." Here comminution is artificially obtained in a degree reached only by the most careful mastication. It is probably seldom that the whole edible nut is reduced by mere mastication to such a fine state as to contain no hard particles when it enters the stomach. Even small particles of such a relatively compact material as a nut in the stomach or intestines experience a slower rate or penetration of the digestive juice and consequent delayed cleavage of the nutrients contained in these food particles. The observed difference of digestibility between the peanut, fed as the whole nut and masticated, and peanut butter indicates the effect which texture may have on the ultimate fate of the food. In the case of nuts fed whole, macroscopic examination of the feces revealed particles of the insufficiently chewed nut. This was especially noticeable in experiments on a dog. It must be pointed out, however, that the dog is not an ideal experimental animal where foods of the texture of nuts are used. This animal bolts his food; and even the preliminary passage of the nut through a meat-chopper, as was the case in all these experiments, is an incomplete simulation of mastication. Further, the dog secretes no salivary amylase, a factor to be considered in experiments where starch utilization is the issue.

When Jaffa fed nuts ground up to a paste in his highly restricted dietaries they were unappetizing in this form to the subject; low utilization resulted. In a ration such as we employed, however, with sufficient adjuncts to permit mixing the paste with other foods, the paste was no less easy to eat than the whole nut.

That cooking causes any marked change in the digestibility of the protein-rich nuts is doubtful. Certainly in the case of the almond as used in our experiments the thoroughly roasted nuts show no advantage or disadvantage over the boiled or raw product. No significant difference appears between the peanut butter made from the roasted nut and that made from the boiled nut.

The raw almond appears to be as completely utilized as the thoroughly steamed nut. Some cooking undoubtedly is necessary in the case of the chestnut with its carbohydrate packed away in starch grains. In the few chestnut trials the nut was thoroughly boiled and steamed previous to feeding. A further study of the factor of cooking, especially with the chestnut, would be desirable in view of the numerous ways in which it and other nuts are prepared for serving.

The pecan, fed either as the whole nut or in the form of a nut paste, showed consistently low utilization coefficients in comparison with the basal or other nut diets. This is in agreement with the results of Jaffa, who found the almond and Brazil nut better utilized than the pecan. The pecan is characterized by having a higher fat content than any of the other fat-rich nuts. Whether this is the determining factor in the relative indigestibility of the pecan cannot be stated at present.

The lichi nut, widely used in the Orient, and becoming more common in American markets, is a product whose composition has not been studied in detail. In our experiments this nut was not fed in large enough quantities to make up a large fraction of the nitrogen or carbohydrate intake; yet it is significant to note that during the lichi periods nitrogen and carbohydrate utilization was below the average. Further study is necessary to reveal whether the nutrients present in this nut are in a form that can be utilized by the body.

In the case of the coconut the amounts of protein or carbohydrate derived from the nut are too small to permit final conclusions being drawn regarding their digestibility but no such lowering of the total utilization of the intake occurred as in the lichi periods.

Trial with the English walnut gave a rather low coefficient. The subject was troubled with a mild diarrhea while on the walnut diet. During this period only did the inclusion of large amounts of nuts in the diet give rise to intestinal disturbances. An irritating effect of the English walnut has been reported by other users of this nut.

The biological value of the individual proteins has scarcely been investigated. Osborne and Mendel (1911) maintained white rats satisfactorily on excelsin, the globulin of the Brazil nut, as the only source of protein in the diet. Johns and Jones (1917) point out that the high lysine content of arachin and conarachin, the proteins of the peanut, make the peanut protein of value as a supplement to diets whose protein is low in lysine. Hoobler (1917) in a study of the diets that give a maximum yield of milk in lactating mothers found that the nut proteins are equal to animal proteins and superior to other vegetable proteins as sources for the elaboration of milk.

The results of our metabolism experiments emphasize what has been previously pointed out by Jaffa and other investigators. Nuts are valuable foods. If eaten properly and used in the diet as eggs, meats, and other foods rich in protein are used, the evidence points to a physiological value on a par with that of more common staple articles of the diet.

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AN EXPERIMENT IN TEACHING CITIZENSHIP

ELSIE M. ROUTH

Critic in Home Economics, Haines Practice School, Chicago Normal College

Any system of education which is not fluid enough to meet the ever changing demands of a community, has failed to accomplish its ultimate usefulness. Particularly is this true in a crisis where failure to meet individual obligations in citizenship is more often due to lack of knowledge than to lack of desire.

The necessary shifting of emphasis upon the conservation of various foodstuffs has created a situation difficult of adjustment to those accustomed to the study of dietetics; to women who scarcely understand even the English words used in the printed directions the situation has in it the element of tragedy.

With an idea of relieving this distress, in July, 1917, the Chicago Board of Education passed a resolution to the effect that whenever twenty or more adults desired instruction in any subject which would increase their value in citizenship, a school would be opened and a trained teacher provided. During the summer and autumn twelve classes in the canning and drying of fruits and vegetables were conducted. The wheat shortage of the early winter created a new demand —the making of good bread from flours other than wheat. This article purposes to relate how one class is attempting to meet the need.

The Haines Practice School is situated in one of the most cosmopolitan districts in Chicago. The two square blocks nearest the school were reported by the last census to be the most populous in the city, containing about 5000 people. A large percentage of the adults are of Italian, Sicilian, Lithuanian, Croatian, and Dalmatian birth. To the women of southern Europe the uses of oatmeal and cornmeal are almost unknown. Hence, the flour ruling of the Food Administration as interpreted by the local retailer worked a real hardship. Children in the domestic science classes of the school reported that their mothers were forced to buy "club offers" of undesirable goods in order to obtain white flour and sugar. These budgets often contained cheap pickles, catsups, and other unsalable canned goods. Others reported being forced to buy 100 pounds of rice or potato flour. Either through the ignorance or desire for gain on the part of the retail grocer no choice of, or division into different kind of cereals was allowed. Sometimes several flours were mixed together and sold as "black flour" which was very much disliked. All this was, of course, far from the interpretation intended by the Food Commission, whose great desire has been from the first, to protect the home consumer.

One morning in January an Italian woman with a shawl over her head walked into the principal's office. She brought with her a little girl of seven to act as interpreter. She showed a piece of dark, heavy, utterly uneatable baked dough. This she declared was the best bread she could make with "black flour." Her husband, she explained through the child, was "mad" and she had 50 pounds of this flour at home; what should she do? The principal sent for the domestic science teacher who took the woman into the school kitchen. There after sending for some of the same flour, the teacher with the aid of a fourteen year old girl in the class who spoke Italian, showed her how to make good bread.

This incident gave the impetus to the forming of a class of adults in war cooking. The first lesson was announced in every room in the school; notices were printed by the boys of the printing class in both English and Italian. The visiting teacher, who had found one woman sifting graham flour into every available dish-pan and kettle in the house while the children played on the floor with the bran, announced the class in each home which she visited. About forty women came.

The lesson was largely demonstration. Oatmeal bread was made and served with butterine and coffee. The making of a sponge with 1 cup white flour, 1 cup luke warm water, 1 cake of yeast (raised one

hour), was emphasized. The sponge bread was mixed in front of the class and taken home to be finished by one of the women. Previously baked bread was served. An Italian lawyer, a resident of the neighborhood, repeated the teacher's lecture and gave an address. Much enthusiasm on the part of the women was shown. The next morning a woman who had been forced to buy 100 pounds of rice flour at 12 cents a pound brought a pan full of it to school and asked to be shown how to use it. When she carried home four big loaves of light bread, she wept over the teacher's hand and exclaimed "Si, Si, when you only *know*."

The second lesson presented entire barley muffins made with baking powder and egg. Emphasis was put upon the need for the presence of either eggs or some white flour to obtain the stretching power necessary to resist the force of the gas in both yeast and baking powder, thus obtaining a light bread. An exhibit was shown of twelve different kinds of flours priced and arranged in the order of their protein value. An eighth grade girl acted as interpreter. The third lesson demonstrated barley bread with yeast; as before emphasis was put upon making a white flour sponge first. The exhibit showed a model breakfast for children. Sandwiches of barley-bread and peanut butter were served. The principal of the school gave a short address. Most of the women understand English although few speak it. Many expressions of a desire to help the war situation were uttered, some in English and some in Italian.

The fourth lesson, given on the Wednesday before Easter, was, by the request of the class, barley coffee cake, and hot cross buns made from the same dough. The basis of the dough was the standard one-egg cake recipe, using one-third barley flour, and substituting one recipe of the sponge made as above for the milk and baking powder. Enough equally divided barley and white flour were added to make a rather soft dough. Hot cross buns and coffee were served. An address on coöperation between home and school was given by an Italian woman, the wife of an Italian doctor. An exhibit of a proper dinner for children was shown, and by courtesy of the State Council for National Defense Caroline Hunt's pamphlet was given to each member of the class. Printed recipes in both languages were distributed. The lessons include meat substitutes, egg cooking, milk, and general child feeding.

Much of the success of the undertaking is due to the hearty coöperation of the Supervisor of Household Arts, and to the printing teachers, the visiting teachers, and the principal of the school.

THE PATRIOTIC POTATO

SARAH ELIZABETH BOWER

New York Public Schools

In the Riverside School, New York City, the potato came into its own during the early days of March.

Nothing could have been finer than the way in which the principal, heads of departments, eighty teachers, and three thousand pupils responded to the invitation of the Domestic Science teachers to participate in a two weeks' potato drive.

The food end of the campaign was necessarily carried on by the Domestic Science teachers in the seventh and eighth grades. Potatoes were boiled, baked, mashed, warmed over, cooked with cheese, milk and eggs, to suit every taste. Some classes cooked in family portions and sold the product in the school lunch room. That the idea really "got over" was well shown here. On Tuesday ten portions were unsold. On Friday every portion was sold within five minutes and the children were clamoring for more. Marketing, care, food value, and use as a substitute for wheat were all duly emphasized.

But the most effective correlation came in grades below the seventh. When history proved the potato to be a 100 per cent native American some surprise was created. It was also discovered that this humble and plebeian vegetable is not only a true democrat, but has become an international as well.

The accompanying suggestions in arithmetic were sent by the head of the department to each teacher, and the problems used sent back to her after being worked by children in their arithmetic periods. The ingenious teacher who applied the savings accruing from substituting potatoes for wheat bread, reported that as a result of the enthusiasm aroused during the drive, the children contributed a dollar in one week to the Junior Red Cross in place of a few cents the week before. Each child in that class took the arithmetic paper home to urge his parents to spread the news of the potato drive to the neighbors.

SUGGESTIONS OFFERED BY HEAD OF DEPARTMENT

Sixth Year. Percentage[1]—food elements, water elements, etc.; denominate units; commission examples.

[1] For percentage of various constituents in potatoes, see Cornell Leaflet, Sept., 1917.

Fifth Year. Denominate units; farmers' profits; part of potato actual food.

Fourth Year. Denominate units; cost and selling price of potato—gain (two operations).

Third Year. Quarts of potatoes in a peck, etc.; cost of quart, peck, bushel; pounds of potatoes in bushel, in peck.

Second Year. Cost of so many quarts of potatoes.

Problems—Grade 1

For lunch yesterday Julia ate 2 potatoes, and for supper 1 potato. Tell me how many potatoes Julia ate yesterday.

A grocer sells 2 baskets of potatoes to one customer, and 4 baskets to another customer. How many baskets were sold?

Last night my sister ate 3 potatoes, and I ate 1. How many did both eat?

One farmer digs up 3 barrels of potatoes, and another farmer digs up 2 barrels. How many barrels have they?

John likes potatoes; he ate 4 potatoes, but Ethel ate only 1. How many potatoes did mother give to John and Ethel?

Grade 2

Bought 5 lbs. of potatoes on Monday, 3 lbs. on Wednesday, 7 lbs. on Friday. How many lbs. did I buy altogether?

Bought a 12 cent bag of potatoes; gave the man 15 cents. Change?

One lb. of potatoes cost 3 cents. Cost of 7 lbs.?

After spending 8 cents for potatoes, I had 2 cents change. How much did I have at first?

Mary and John had a garden. Mary dug 3 quarts of potatoes from her garden and John dug 5 quarts. How many quarts did they dig together?

Mrs. Smith bought 7 quarts of potatoes; she cooked 4 quarts. How many quarts had she left?

Mary bought altogether 9 quarts of potatoes; 5 quarts were sweet potatoes. How many were white?

Mrs. Jones had 7 children. She baked a potato for each. How many did she bake?

Grade 3

If 12 lbs. potatoes cost 48 cents, how much will 1 lb. cost?

I have 1 peck potatoes. How many quarts have I?

I had a quarter and spent one-fifth for 1 quart potatoes. How much did I spend?

There are 462 potatoes in 3 bags. How many are there in 1 bag?

I had fifty cents and spent nine cents of it for potatoes. How much money had I left?

Grade 4

Mrs. Brown cooked 27 potatoes for dinner. Her family ate $\frac{2}{3}$ of them. The remainder she fried for supper. How many did she fry?

A grocer sold 37 lbs. of potatoes one day and 46 lbs. another day. How many did he sell?

I paid 13 cents for potatoes. How much change did I get from half a dollar?

John ate $2\frac{1}{2}$ potatoes and his brother ate $1\frac{1}{2}$. How many did both eat? How many slices of bread did they save if 1 potato is equal to one slice?

A farmer had 90 bags of potatoes. He sold $39\frac{1}{4}$ bags. How many left?

A grocer sold 37 $\frac{1}{2}$ lbs. of potatoes to one customer, $17\frac{7}{8}$ lbs. to another, and $9\frac{1}{4}$ lbs. to another. How many lbs. sold?

A man bought 84 bags of potatoes at \$1.25 a bag. If he sold them for \$126.00 how much did he make?

Grade 5

A farmer raised 250 bu. of potatoes on one field; 391.52 bu. on another; 815.7 bu. on a third, and 587.031 bu. on a fourth. How many bu. did he raise?

A grocer buys 32.5 bu. of potatoes at \$1.25 per bu. Find the value.

$32\frac{3}{4}$ bu. of potatoes were divided equally among 16 families. How many did each receive?

How many paper bags will be required to hold 96 potatoes if each bag holds one dozen?

A man raised 424 bu. of potatoes and sold $\frac{5}{8}$ of them. How many left?

How many quarts of potatoes can be sold from a bag containing 13 pecks?

How many loaves of bread would a family of 5 save in 2 weeks if each member ate a potato at lunch and dinner instead of a slice of bread, allowing 16 slices to a loaf? $8\frac{3}{4}$ loaves.

How many lbs. of flour would that same family save in those 2 weeks, allowing $3\frac{1}{2}$ lbs. of flour to 3 loaves of bread?

$$\tfrac{1}{3} \text{ of } \tfrac{7}{2} \times \tfrac{35}{4} = 10\tfrac{5}{24} \text{ lbs.}$$

How many lbs. of flour would be released for our soldiers and sailors and allies if the 20 million families in the U. S. were patriotic and loyal enough to do this?

$$\tfrac{245}{24} \times 20 \text{ million} = 204\tfrac{1}{6} \text{ million lbs.}$$

Potatoes are 30 for 25 cents. What would it cost that same family for each member to substitute a potato for a roll at breakfast for 1 week?

$$7 \times 5 \times \tfrac{25c}{30} = 29\ \tfrac{1}{6} \text{ cents}$$

What would rolls cost for one week? $7 \times 5 = 35¢$

How much money would that same family save in 2 weeks by being patriotic and substituting the potatoes for the rolls?

$$2\ (35¢ - 29\tfrac{1}{6}) = 11\tfrac{2}{3}¢$$

If the 20 million families in the U. S. did this and saved $11\frac{2}{3}$¢ each and gave the money to the Red Cross, how much money would the Red Cross receive?

Suppose $\frac{1}{2}$ was given to Red Cross and $\frac{1}{2}$ used to buy thrift stamps; how many thrift stamps would U. S. sell? How much would Red Cross receive?

Suppose war saving certificates were purchased with $\frac{1}{2}$ of this money in March; how many would the U. S. sell?

Grade 6

Potatoes contain about 18 % of starch. How much starch can be obtained from 225 bushels of potatoes, each bushel weighing 60 lbs.?

An agent sold 350 bushels of potatoes at $1.80 per bushel and charged $1\frac{1}{2}$% commission. How much was returned to the owner after paying $5.00 storage?

An agent received $21.00 commission for selling 120 barrels of potatoes at $7.00 per barrel. Find the rate of commission.

A load of potatoes weighing 600 lbs. yielded 108 lbs. of starch. What per cent of starch was obtained?

What will 9 bushels of potatoes cost at 7 cents per quart?

English, including spelling and writing, proved a fertile field for the raising of patriotic ideas as the compositions in grades from the first through the sixth show. The botany, history, and geography of the potato were not neglected.

COMPOSITIONS—GRADES 2 to 6

I am a little brown potato. I have come to beg you to cook me, to eat me, and to like me. In this way you can save wheat and so win the war.

NANCY PEPE, 2B

Save the meat! Save the wheat! For dinner eat—potatoes!

SYDNEY GELFOND, 2B

Potatoes are cheap. Help to win the war. Eat potatoes and save wheat.

GILBERT DUNN, 2B

Potatoes are plentiful and cheap. They are healthy and will nourish me as well as wheat bread. In any of the many ways of cooking they taste fine. I want potatoes, not wheat bread, to help our Soldiers and Allies.

PAULINE SULTON, 3B

Many years ago white people did not know about the potato. The Indians of South America taught them it was good food. Now nearly everyone except the Chinese grow potatoes and eat them. We should eat more potatoes to save wheat for the soldiers.

HAROLD BOWENS, 3B

We are saving wheat to win the war. We are saving wheat by eating plenty of potatoes. We should eat plenty of potatoes because they are cheap. Potatoes are good for us because they contain mineral substance, water and starch. I am going to save my share of wheat by eating plenty of potatoes.

NELLY CASSULLO, 4A

I am a potato. My skin is yellow. My flesh inside is white. I grow underground of the roots of the plant. I contain starch, water, and iron. I am a wholesome food. I can be boiled, baked, mashed, or fried. Eat me and save wheat for our soldiers.

JAMES PUGH, 4A

I am pure white inside. I have a brown jacket and grow under the ground. On my body I have little scars called eyes. If I am planted in a mild or warm dark place I will sprout. When I am ripe my leaves decay. Then the farmer knows when I am ripe. A true Patriot will eat me and help win the war by saving wheat bread.

CECILIA GRIBBEN, 4B

The potato is a very healthy vegetable and was first heard of in the New World. The people of Europe did not appreciate the potato at first but used it as food for pigs and cattle and sometimes used it for the poor people.

In the olden times the Egyptians, the Greeks, and Romans did not know what the potato was until about the fourteenth century. Sir Walter Raleigh carried the first specimen to Queen Isabella. The potato was planted in her flower garden as a curiosity.

The potato is an odd vegetable. It is a tuber and grows under the ground. It is grown all over the world. Germany grows one-fourth of all planted. Potatoes are nourishing food. We must eat more potatoes to save wheat and help win the war.

ZENIA VASSILIADE, 5B

The potato was first found by white men; it is an American plant. Sir Francis Drake and Sir Walter Raleigh both found it in America. They were trying to find a place for it to grow. When they took it to Ireland they

found it would grow there good. The potato is a food plant and not grown by seeds. It is not so good to eat alone, but with richer food. We should now try to eat less wheat and a lot of potatoes to help win the war.

FRANCES FARRELL, 5B

We have potato week to make us think of those who are fighting for our benefit. We may not be able to send potatoes but we can send wheat, corn, and other cereals. In our school auditorium we have a sign that says, "Eat more potatoes and save wheat."

The food value of the potatoes are water, starch, and iron. The potato grows very quickly if the potato is planted, but if the seed is planted it takes one year for the little one and if you plant that you will get an ordinary potato the next year. It is planted about one-half a foot below the ground. The part we eat is the thickened stem which is called the tuber. It grows best in a temperate climate and most any soil, but best in sandy soil. The amount raised in the United States is second to the amount of cereal produced. The best known varieties are the Early Rose and the Burbank.

The people of South America were the first to raise potatoes. When the Spanish conquered Peru they found potatoes that the Aztecs had planted and took them back to Europe. The Burbank was first planted from a seed. Potatoes are the only ones of their family that are not poisonous and fit to eat. It belongs to the Night Shade. The most important use of the potato is as food and starch for the clothes and for liquor which we are trying so hard to get rid of. Let us be loyal citizens and do "our bit" to feed our boys.

HARLAN WOOLEY, 6B

OUTLINE FOR NATURE STUDY. GRADES 5 AND 6

Family: Nightshade (many members of this family poisonous).

Part of plant: Thickened stem, growing under ground—called tuber.

Use to plant: The starch, mineral matter and water provide nourishment for the new plant until it can send its roots down into the soil.

How planted: From piece of old potato containing at least one bud or eye. New varieties are raised from seeds. The best known varieties are Early Rose and Burbank. (Mr. Luther Burbank, when a school boy, raised the latter from the seeds of Early Rose.)

Value as a crop: It will grow on almost any kind of soil. It will grow in any country having a temperate climate. If grown from eyes, it will yield a crop the first year. It furnishes an excellent food for man and animals. In the United States the potato crop is next in size to the cereal crop. Beside being used as a food, it is manufactured into starch and alcohol.

Chemical composition: Mineral matter—Cut thin slice and hold to light; faint color under skin shows one mineral substance. Starch—Grate potato,

press through cloth. Allow sediment to settle from liquid, pour off liquid and test sediment with iodine. Blue color indicates starch.

For other interesting information: "How the World is Fed," Carpenter. Cornell Leaflets, Sept. 1912, and Sept. 1917.

Though unable to draft sewing and music in the service of the potato, art came gallantly to the front, for the drawing course provides for the drawing of some vegetable in each grade.[2]

Finally the potato reached the public distinction of an Auditorium exercise. A number of children gave a reading, telling interesting facts about the potato. Another group recited the enclosed recitation, at the end of which two girls held aloft the big poster (displayed in the Auditorium during the entire drive) flanked on either side by an American flag, urging every one to

EAT
POTATOES
AND
SAVE WHEAT

EXERCISE GIVEN IN ASSEMBLY DURING THE POTATO DRIVE BY 5B CLASS

(*Each child holds up letter as she recites*)

P Stands for patriot, Who's doing his share
By eating potatoes, To send wheat "over there."

O Stands for oven, Exceedingly hot,
To bake our potatoes, "Please give me a lot."

T Stands for table, On which they are placed,
They make my mouth water, "Do give me a taste."

A Stands for American, If *you* really are one
You'll eat lots of potatoes, And just think it's fun.

T Stands for the trenches, Where our soldiers now stand,
Send them plenty of wheat, And they'll save our dear land.

O Stands for ocean, Across which they must go,
We must save a great deal, To help beat the foe.

E Stands for everyone, Little and great,
Let each do his share *now*, Before it's too late.

S Stands for soldiers, So big and so brave,
Eat potatoes for *your* share, See how much wheat *you* can save.

[2] A set of drawings is in the JOURNAL Office and will gladly be loaned to anyone interested.

STUDENT CONTRIBUTIONS

A STUDY OF GINGHAMS

RUBY McTAVISH

Textile Chemistry Laboratories, Iowa State College

During a recent series of lectures here, a number of questions came to us from out in the state concerning the relative shrinkage and wearing qualities of different priced ginghams. With a view to finding answers to some of these, the following short study was undertaken in connection with the above work on domestics. The materials chosen were: (1) group of odd plaids varying in price from 12½ to 35 cents; (2) a group of small checked pieces priced from 10 to 25 cents; (3) two plain blue pieces, 15 and 25 cents, respectively, and one blue shirting at 15 cents. These ginghams were purchased in February and were characteristic of the materials used for children's school dresses, house dresses, and apron materials whose shrinkage and wearing qualities are so important.

The same tests were carried out as are outlined in The Study of White Goods in the January JOURNAL, the same methods being used with the exception of the shrinkage. In this case the materials were all entered at 60°C., one set being removed at the end of an hour and the other after remaining immersed all night. This was done partly because no housewife would place ginghams in boiling water and partly because we were interested in the difference which this factor might cause.

CONCLUSIONS

Without exception the number of threads per inch both warp and weft increased with the price of the material in all three groups. The shrinkage of the warp decreased with the price of the material but the results for the weft did not follow the prices. In most cases the shrinkage of the weft was not large enough to be considered in making a dress, but the shrinkage of the warp would have to be allowed for. The material which was left in for one hour showed a little more shrinkage than that which remained over night. The breaking strength did not

increase with the price of the material. No doubt this was due to the irregularities of the bleaching and dyeing methods employed in its manufacture. In other words there are a number of conditions which must be taken into consideration when studying colored dress materials such as ginghams which do not arise when we are dealing with domestics. From these results we seem justified in concluding that the number of threads per inch has no direct bearing on the wearing qualities of ginghams but does influence the shrinkage. The price asked for the material is usually directly proportional to the number of threads per inch and the best the purchaser can do is to judge the value of her purchase by the thread count and the suitability of the piece to her purpose.

Comparison of Materials

PRICE	WIDTH	THREAD COUNT (PER INCH)		SHRINKAGE (PER CENT)				BREAKING STRENGTH[1]	
				One hour in water		All night in water			
		Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft
Plaids									
	inches								
$0.12½	26½	69.0	48.0	4.8	1.4	4.2	1.8	35.5	19.8
.19	32	75.0	59.0	4.4	3.8	4.5	3	36.2	21.6
.35	31	82.8	76.5	2.4	2.45	2	2.1	30.5	25.6
Checks									
.10	27	55.3	45.3	6	2.7	5.5	2.4	27	23.1
.12½	27	69.5	48.0	4.9	0.8	4.9	0.4	36.6	18.2
.15	27	73.0	68.0	4.2	3.5	3.7	3.3	34.5	25.4
.25	27	80.6	80.6	3.9	3.9	2.9	2.5	27.3	25.4
Plain blue									
.15	27	71.5	61	5.2	0.5	4.3	0.3	32.4	25.6
.25	31	82.0	74	4.5	3	3.29	2.83	34.3	24
Shirting									
.15	28	69.5	49	4.35	0.9	4.2	1.48	45.13	21.34

[1] For breaking strength an average was taken of 10 good results from a calibrated machine.

FOR THE HOMEMAKER

A CONSIDERATION OF THE CANNING PROBLEM

ELIZABETH F. GENUNG

Simmons College, Boston

In these days of food conservation the canning of fruits and vegetables is occupying the attention of the press and the housewife. Every publication which deals with home problems, every periodical of any kind which reaches the household has devoted a page or a column to the canning problems. In view of this extensive publicity it has been noted with interest that many of the methods suggested and many of the articles written seem to have little if any scientific basis.

The successful preservation of any organic material is based on the science of bacteriology. A little over fifty years ago, a French scientist proved, after a long series of experiments, that all decay or putrefaction of organic matter was due to the activities of minute organisms. Since this discovery there has been much research and investigation by scientists in every country, and the facts which Louis Pasteur discovered have been repeatedly proved true.

It has been found that if all growth of microörganisms can be checked, or those organisms killed, that material will keep indefinitely. The problem of canning rests primarily on this basis: that all microörganisms on the food placed in the can must be destroyed, or their growth checked to such an extent that they will not cause trouble. There are various ways by which bacteria may be killed but the most practical for the purpose we are considering seems to be the application of heat.

There are three kinds of organisms which cause trouble in canned food, namely, molds, yeasts, and bacteria. Let us consider each briefly in order that we may learn the best methods of killing each.

Molds are familiar to the ordinary observer, for they grow on almost any organic matter and produce a fuzzy appearance. They may be of various colors,—green, yellow, black, or a grayish white. They reproduce and multiply by means of spores which grow on specialized

fruiting bodies; one plant producing millions of these tiny spores which float about in the air and alight and grow wherever conditions are favorable. These spores are quite easily killed by heat and a few minutes boiling will effectually destroy them. Molds prefer for their best growth starches or sugar, some moisture, and ordinary room temperature. They will not grow unless air is present. They do not injure the material on which they grow to any marked extent for some time, but they gradually break down the tissues and render the material soft, and unfit for consumption.

Yeasts are also familiar to the housewife for they are the principal factor in bread making, but aside from their usefulness in this line they often cause trouble in food materials in which they may be present. They are tiny, one-celled plants which reproduce and multiply usually by buds which grow on the mother cell. These yeast plants are found on all fruits and cause the fermentation of the juice which results in the production of alcohol. They prefer for their best growth sugar or starch, plenty of moisture, and a temperature a little higher than that of an ordinary room. They do not grow without air except when certain sugars are present from which they can manufacture oxygen. The chief trouble caused by these organisms is the fermentation of the starch or sugar which results in the production of alcohol and a gas known as carbon dioxide. They are readily killed by a few minutes boiling and the problem of controlling them is a comparatively easy one.

Bacteria belong to the smallest class of microörganisms and can only be seen through the highest power of the microscope. They exist in countless millions in nature and produce various changes in organic material. They reproduce and multiply by a simple cell division, one cell dividing into two cells and each of these in turn into two more. When conditions are unfavorable for the growth and multiplication of the cell, certain kinds of bacteria have the power of concentrating the cell contents into one part of the cell and surrounding this portion of the cell with a hard coat which is very resistant to heat, drying, or chemicals. This spore, unlike that of the yeast or mold, is not for the purpose of multiplication but merely to tide the organism over an unfavorable period. When conditions become favorable an ordinary cell known as the *vegetative* form develops from this spore. Bacteria generally require for their best growth surroundings with a small amount of protein and sugar or starch, and plenty of moisture. Certain forms live only in the presence of air; other forms live only in the absence of air; still others

are able to adapt themselves to either condition. Bacteria ferment sugars and break down tissues causing decay.

Effect of sugar and heat on the growth of bacteria. Microörganisms differ in the effect of sugar on their growth. Molds will grow quite readily on foods low in sugar and also on materials containing a high percentage of sugar, such as jellies or preserves. Yeasts, as a rule, are less liable to grow in foods that contain a large amount of sugar, but there are varieties which grow in jellies, syrups, and even molasses. The growth of bacteria, on the other hand, is prevented by high concentrations of sugar, though a small amount may in many cases encourage it.

Bacteria are not so easily disposed of as their cousins the yeasts and molds, for, although the vegetative cells are easily killed by heating, the forms which have the power of producing spores are very resistant to heating and drying. Certain spore forms have been found to resist boiling for several hours. It is a more difficult problem to destroy them than other forms of microörganisms. It is this problem that we shall deal with chiefly in the remainder of this discussion.

In considering the problem of canning we shall take up the problem only as it relates to the preservation of fruits and vegetables.

Canning fruit. In the preservation of fruit by canning, we have to remember that the principal kinds of microörganisms found on fruit are wild yeast and a few bacteria. Since yeasts are easily killed by heating, these organisms do not cause trouble except in rare instances when a few cells escape the vigilance of the housewife and ferment the fruit, causing the can to burst if not discovered in time. Bacteria are also found on fruit but the acidity of the fruit, the high concentration of sugar used in the preservation of the fruit in addition to the heating process, all combine to prevent the growth of the bacterial cell. Fruit is therefore comparatively easy to preserve if the housewife is careful to observe the following rules:

1. Select only sound fruit well matured but not over-ripe.
2. Put it, while fresh, into clean, sterile cans.
3. Select cans that have good seals and use only new rubbers.
4. Heat the fruit in the cans in the water bath for a few minutes, remove, seal, and cool. Do not remove cover after taking cans from water bath.
5. Store in a cool dark place.

Canning vegetables. The preservation of vegetables is much more difficult for several reasons. In the first place the vegetables grow much nearer the ground than most fruits and therefore have a large number of soil bacteria on them. These soil bacteria often form very resistant spores. Vegetables are not preserved in sugar or any agent that will check the growth of bacteria; so we must depend on heating alone to kill the bacteria present.

The safest way to can vegetables is to cook them in a pressure cooker. This cooker is so constructed that it is possible to raise the temperature of the interior of the can to several degrees above the boiling point and thus kill the resistant spores. Unfortunately pressure cookers are expensive for the ordinary housewife who wishes to preserve only a few surplus vegetables and may have only a few cans of each. She must resort, therefore, to the water bath method. There is no sure way to preserve certain vegetables by cooking them in a water bath, but some ways are safer than others. It must be distinctly understood that in all water bath methods there is a certain measure of risk, but the risk is greater in some methods than in others.

Methods compared. This discussion is not intended as a criticism of any method or methods but it is intended to place all the information available at the disposal of the housewife in order that she may be able to choose the method she prefers with full knowledge of the possibility of spoilage or other troubles it may envolve.

Bacterial spores, as stated above, are very resistant to heat. They may be boiled for some time without lessening to any marked degree their vitality, so that when conditions are more favorable they will produce growing cells. Most vegetables allow the heat to penetrate very slowly to the center of the can and probably this never reaches the temperature of the water bath. The more compact the vegetable the lower the temperature will be in the center of the can. Cooking vegetables for several hours continuously in the cans will kill all vegetative forms of bacteria and may kill some spore forms but there is always the risk that some of the resistant ones may be left, and that these will find conditions favorable for growth and cause trouble after the material has stood awhile.

The method used in the bacteriological laboratories to sterilize culture media which cannot be subjected to high temperatures under pressure is what is known as the fractional or intermittent method. This is founded on the theory that after heating the spores are somewhat

weakened and, in favorable surroundings of food, moisture, and temperature, will quickly develop into vegetative cells. It has been found that in twenty-four hours this process will have developed the vegetative forms of most of the spores so that another heating at boiling temperature will kill most of the bacteria present and that a possibility of growth is lessened by a third heating at the end of another twenty-four hours. The length of the heating period is determined largely by the kind of material, the temperature at which it is heated, and the kind of heat applied.

The preservation of vegetables by this method, therefore, carries with it a certain measure of scientific proof—although it has been found that some vegetables such as greens are not always sure to be sterile after this treatment but a probable lesser percentage of spoilage in cans treated in this manner has lead the writer to advocate it as safer than the continuous process.

Much depends on the age and freshness of the vegetables. Young and tender vegetables allow the penetration of the heat much more rapidly and thoroughly than older and tougher material. The same is true of fresh vegetables as compared with stale ones. The size of the can must also be taken into consideration in counting the time of cooking, for it will take longer for the center of the can to reach its maximum temperature if the can is large. Much depends on the soundness of the material; the freedom from decay or disease will materially affect the keeping of the material.

Extent of research. Very little has been done experimentally in the field of canning. It is difficult to lay down a set of rules that will prove infallible under all conditions and with all workers. It is necessary that years of work be done on any problem involving scientific research before a definite rule or formula may be set down. The problem of home canning has scarcely been touched in the bacteriological laboratory; therefore, it cannot be said that any method is sure nor is it determined what will cause or prevent certain kinds of spoilage.

Articles which advocate various methods with every degree of assurance should not be regarded as infallible until they bear the stamp of scientific research, or until they can cite actual experimental evidence to back up the statements. Therefore, it will be well to bear in mind that such articles are written usually by a person who knows little about the scientific basis of that which he writes and who is only trying to encourage the housewife in a time of stress. The housewife should,

therefore, choose her method fully alive to the fact of the possibility of spoilage and she may choose intelligently between the shortest method with perhaps a greater possibility of failure or the harder method with the smaller chance of failure.

Necessary precautions. In the preparation of the vegetables for the cans there are many steps that have a certain value. The material must be clean and free from decay. After the vegetables have been washed they are blanched in hot water. This blanching consists in boiling or steaming the material a few minutes. The chief value of this process is that it removes any objectionable acids or flavors and also renders the vegetables more pliable for packing in the cans. It has very little if any value from the bacteriological side. No experiments have been carried on to test the exact effect it may have on the bacterial spores but enough is known of the nature and resisting power of these spores to draw the conclusion that this short boiling process does not materially affect the spores.

After the material is removed from the blanching water it is plunged for a few seconds into cold water. The reasons given for the process vary, but it is generally believed that it sets the color. At least it makes the material easier to handle in packing in the cans. It has been claimed that this process "shocks the spores," but up to date there is no scientific data to back up this assertion, and bacteriologists are a bit skeptical about its effect on the spores. It probably has nothing to do with the keeping quality of the material.

When the cans are ready for the water bath they should not stand in a warm kitchen before cooking, as the organisms are present in large numbers and their activities may cause disagreeable flavors in the food material. If it is necessary to leave the cans a short time, it is better to keep them cool and not to add the hot water until just before cooking.

The cooking of the material is also important. Remember that it takes a long time for the center of the can to reach its maximum temperature, and that allowance must be made for the can to heat up. Therefore, the period of cooking should never be shortened nor should time be counted before the water in the bath boils briskly. It should not cease boiling at any time during the cooking period. When the cans are removed from the bath they appear to be boiling but this bubbling is not actual boiling. It is caused by the difference in pressure of the interior of the can and the surrounding air.

Care of canned goods. When the cans are cooled so they may be handled readily, they should be placed in cold water or near a cool window in order that they may cool as rapidly as possible to a temperature below that which the bacteria require for their best growth. Cooking the cans in a water bath for a period may not sterilize the material but it may weaken the bacteria so that they will not grow unless all conditions are favorable. We have the temperature conditions under our control and that should be low enough to discourage any kind of activity. Therefore, cans stored in a cool place will keep better than cans stored in a warm place. The quicker cans are placed in cool surroundings the more apt the material will be to keep. The writer has proved this quite satisfactorily by keeping cans in an ordinary room for several days, then placing them in a bacterial incubator. The cans which often showed no sign of spoiling while in the room would spoil in a few days as soon as the temperature became right for bacterial growth.

KINDS OF SPOILAGE

There is very little data to be had regarding the kinds and causes of spoilage in canned foods. Some work has been done on peas and corn at the request of commercial canners during some particularly trying time, but the spoilage of canned vegetables is practically an untouched field. There are three kinds of spoilage commonly recognized at present: (1) Fermentation, (2) flat sour, (3) putrefaction.

Fermentation is the name given to the spoilage which occurs with a production of gas. In the commercial world this is known as a "swell," because the cans become distended and bulge at the ends. Fruit is especially subject to this kind of spoilage owing to the fact that the organisms causing fruit to spoil are usually yeasts and they always produce gas. Certain bacteria are gas producers, and since they often occur on vegetables this kind of spoilage is frequently found in cans of vegetables. Probably this spoilage is due to a number of different organisms and may be accompanied by other troubles that are lost sight of in the interest which the gas affords. Many of these gas formers are spore formers, and so such fermentation usually comes from improper sterilization. Glass cans are frequently broken or at least the seal is loosened by the gas and such spoilage is laid to poor sealing. Since these organisms are usually anaerobic, that is, they prefer to live without air, the conditions in the cans are just what they need and growth

takes place quite readily. Cans should be examined every few days for a month after storing to see if any signs of gas are present. This form of spoilage is quite easily recognized by the presence of gas bubbles and excess pressure on the cover which loosens the seal.

Flat sour is the name given to the spoilage which occurs with a production of acid but no gas. In commercial canning the name was given to designate those cans which were spoiled but no swelling or bulging had occurred to indicate trouble until the cans were opened, when the material was found to be sour and unfit for consumption. This spoilage is doubtless due to several different organisms and may be of various kinds. It has never been investigated to any extent and little is known of its nature. The writer has isolated spore bearing organisms from cans which have soured, and so has come to the conclusion that it is due to improper sterilization. In glass cans this trouble can be readily recognized in many cases by a milky sediment in the bottom of the can; the material becomes slimy and has a sour or acid taste. Certain forms, however, do not manifest themselves in this manner and cans which have no signs of spoilage will be found to taste sour or disagreeable. This is especially true in asparagus and greens. Only a person expert in this work can detect spoilage of this kind by observation alone. As stated above, no work has been done on this form of spoilage and whether it is injurious to eat such material is not known. In the earlier stages the flavor does not seem to be badly affected and is often eaten by those unfamiliar with this kind of spoilage. This trouble cannot be recognized by the condition of the seal for since no gas is produced the seal remains unimpaired and cans badly spoiled will be as difficult to open as those which are uninjured.

Putrefaction is simply decay of the food material in the cans. It manifests itself sometimes by the production of vile smelling gases, or by the disintegration of the food tissues. This form of spoilage may be due to imperfect sterilization but it is more often found in cans which are imperfect or where the seal is poor. There is little difficulty in recognizing this form of spoilage and the cans are usually in such a condition that they are discarded at once.

Botulism. There has been some agitation recently over the occurrence of Botulism from canned vegetables. While there is a small danger from infection of this kind, the number of cases on record is exceedingly small compared with the vast numbers who use canned foods. The organism causing the trouble is a bacillus which lives on foods rather

high in protein content. It produces a toxin which is poison, but which happily is readily destroyed by a few minutes boiling. The organism forms spores which are less resistant than spores usually found in the cans. Since the temperature of the water bath is less than in the pressure cooker, it may be possible that the occurrence of the poison might be found more frequently in cans cooked at the boiling point. In any case the risk is small and may be entirely obviated by boiling the canned article a couple of minutes before eating. It is never advisable to eat any article where there is suspicion of spoilage. Flat sour is not necessarily poisonous but there may be poisons present and it is not safe to eat such food.

THE RELATION OF VEGETABLES TO SPOILAGE

Here again we are treading on unknown ground. Nothing has been worked out in this field as yet, but some observations made on a few cans in starting some work on this problem may not be amiss.

Greens seem to be somewhat difficult to can successfully. They are quite subject to flat sour and seem to be harder to sterilize than some of the other vegetables. This may be due to two causes; first, they grow very near the soil and there may be a higher content of the soil and water bacteria on them, and second, they are very pliable after they are blanched and may be packed very tightly in the cans, and since heat does not penetrate this material very easily it is very probable that the center of the can does not heat up to a very high temperature and thus the spores remain uninjured and grow as soon as conditions permit. It would be well not to pack the cans too tightly and to be certain that they are heated thoroughly in the cooking process. Greens are more apt to spoil by the continuous process than by the intermittent, but even the latter is not sure. The term "greens" is intended to apply to such materials as dandelions, spinach, chard, asparagus, and so forth.

Peas are more difficult to can than is generally supposed. They seem to resist heat penetration and the more mature they are the more difficult it is for the heat to penetrate to the center of the can. They develop both gas fermentation and flat sour. They should never be allowed to stand outside of the shell over night before canning as they are liable to develop a bad flavor. This has been termed flat sour but is probably not a bacterial trouble but due to enzymes present in the peas which under these conditions cause bad flavors and injure the texture

of the vegetable. Unless peas are very young and tender it is better to cook them intermittently if one wishes to avoid as far as possible the possibility of spoilage.

Beans are not considered so difficult to can as peas by some people, but no experiments have been tried to prove this. String beans develop flat sour quite as frequently as many other vegetables and care must be taken to prevent this. The beans should be young, tender, and free from disease. Unless they are very young the intermittent method is the safer. Heat probably will penetrate beans more readily than peas and thus render sterilization somewhat easier. To insure the conservation of all the nutrition possible they should not be cut until after they are blanched and cold dipped.

Corn seems to be very difficult to can successfully. This is due no doubt, to the fact that it can be packed very tightly in the cans and that heat penetrates the material very slowly. There is also frequently found on corn an organism which produces an immense amount of gas in a short time. Corn, therefore, is very apt to ferment and burst the cans. Corn will also develop flat sour and become spoiled in this way. It is very important that this vegetable be as fresh as possible when canned and that it should not be allowed to stand more than an hour before cooking after it is ready for the can. The gas producing organism mentioned above will grow quite readily in the prepared material and the housewife often repents of the delay when the cans burst on heating. If the weather is very warm it is best to cool the cans down as rapidly and as low as possible between the first and second cooking in the intermittent process. In the opinion of the writer corn should always be canned by this process and as an extra precaution, the first cooking should be at least one hour and a half.

Beets do not seem to be so difficult to can successfully as the other vegetables we have been considering. They are blanched for a longer period and seem to be quite easily sterilized by the single process. This may be due to the fact that the heat penetrates more easily, and the longer blanching period may weaken the spores. It is probably not due to any marked extent to the sugar in the beets. Beets develop flat sour easily recognized by the change in color from a bright red to a muddy brown, with a thick whitish sediment in the bottom of the can. No doubt there are other forms of spoilage but the writer has not studied them enough to be familiar with them. Both beets and carrots should be sterilized by the continuous process.

SUMMARY

There are certain underlying rules and principles that apply to all canning and it might be well to mention them in conclusion. The covers of the cans should never be removed after the material has been cooked in the cans for the required period. Rubbers should be placed on the cans before processing and should not be removed unless they are injured. If it is necessary to open the cans they should be recooked at once for at least thirty minutes. If the water boils out of the can it is not necessary as far as the keeping quality is concerned to replace it. If the food is sterile it will keep whether it is covered with water or not. One may preserve a can half full of material quite as successfully as one completely filled, if it is properly sterilized. The old idea that there must be no air in the cans is a fallacy, for if the food is sterile the air is also sterile and sterile air cannot cause spoilage.

Since it is a wise plan not to allow any more bacteria in the cans than possible, cans should be sterilized, or at least partially so, before using. It is best, therefore, to boil all cans at least fifteen minutes before filling them; a longer period will add to the efficiency of the can. The cans should be filled while they are hot and if they are removed from the hot water before they are used the covers should be placed on them. Can rubbers should be placed in hot or boiling water a few minutes before using.

Housewives could aid the experimental work greatly by observations which they make in their own kitchens. At present definite information as to the success of the various methods of food preservation now being used and advocated is meager. If the housewife would make notes of the method used, the number of cans treated, the amount of spoilage, if any, and the kind of spoilage, and send such information to the county agent or the state experiment station, she would be doing a great deal to insure future success in the canning problem and to eliminate the possibility of spoilage. It takes not months but years for the laboratory to work out these problems and it involves a great expenditure of time and material. Housewives instead of concealing the fact of spoilage should take pride in aiding the investigators by sending the much needed information.

EDITORIAL

The Day's Food in War and Peace. If, as now seems possible, the special request of the Food Administration after the next harvest will be not so much for substitution of various kinds as for cutting down our total consumption in order that we may have a safe reserve, it will be even more necessary than it is now for us to know exactly what our food requirements are, that we may neither use more than we need nor, in our endeavor to be careful, lessen our efficiency by using too little.

The United States Food Administration, in coöperation with the Department of Agriculture and the Woman's Committee of the Council of National Defense has just issued a series of lessons called "Food in War and Peace," giving simple and brief statements of the kind and quantity of food needed for health, and of the ways in which changes may safely be made so that the requests of the Food Administration for saving, substituting, and using the various foods may be intelligently, rather than arbitrarily, obeyed.

The names of the writers of these papers are all familiar to the readers of the JOURNAL. Mr. Hoover has explained the present situation in "Food and the War;" Dr. Lusk is the writer of "Food for a Day;" Dr. Taylor has told about Wheat, and why we should save it. Other lessons have been written by Dr. Langworthy, Miss Hunt, Mr. Brand, Dr. McCollum, Dr. Mendel, and Dr. Ruth Wheeler. Miss Ida Tarbell has written the introduction to the lessons.

The lessons were edited by Miss Atwater, of the Department of Agriculture, and Mrs. Norton, of the JOURNAL, who have added practical suggestions and some recipes. References to government publications are given, and a list of lantern slides that may be obtained from the United States Food Administration.

The lessons may be obtained from the Federal Food Administrator in each state, as long as the limited free edition lasts. A copy has been placed in every library.

The Southern Home Economics Association will meet at Blue Ridge, N. C., August 24–31. Half day sessions will allow time for rest and recreation at a delightful mountain resort. For reservations write Mr. C. Fletcher Guillian, Blue Ridge, N. C.

BOOKS AND LITERATURE

Mechanics of the Household. By E. S. KEENE. New York: McGraw-Hill Book Company, 1918, pp. 391. $2.50. By mail of the Journal, $2.65.

Professor Keene in Mechanics of the Household approaches the study of the mechanisms, appliances, and physical phenomena of the home from a somewhat new angle. He states "The scope of the work is such as to present, first, the use of household mechanical appliances." The formal boundaries and the formal statement of physics receive only incidental attention. In educational circles one hears much about the advisability of reversing the old order of teaching science from principles first and applications later to applications first and principles later.

The subject-matter of this book will be indicated by the chapter headings,—the steam heating plant, the hot-water heating plant, the hot-air furnace, temperature regulation, management of heating plants, plumbing, water supply, sewage disposal, coal, atmospheric humidity, ventilation, gaseous and liquid fuels, electricity. From the point of view of educational reform it seem advisable that many science books of this type should be written. The recent text-books in general science for use in the high school contain a wealth of suggestive material for such treatment. Mechanics of the Household has been written to meet the needs of more advanced students pursuing practical science courses.

The chapter on the steam heating plant deals with the following,—heat of vaporization, steam temperature, gage pressure, absolute pressure, two pipe system, separate return system, overhead or drop system, water filled radiators, the house heating system boiler, boiler trimmings, the water column, the steam gage, the safety valve, the draft regulator, rules for proportioning radiators, proportioning the size of mains, forms of radiators, radiator finishings, pipe coverings, vapor system of heating. This chapter covers thirty-six pages with thirty-one cuts and diagrams including a number of sections of radiators, furnaces, and a section of a one-pipe steam installation.

The first eighty-one pages are devoted to a discussion of steam, hot-water, and hot-air systems, temperature regulation, and management of heating plants. A hundred pages are devoted to humidity, ventilation, and fuels. The book is clearly written and well printed. Most of the diagrams are of good size and very helpful.

For purposes of general instruction a further elimination of minor technical detail may seem advisable to some, but those who are acquainted with the prolixity of the standard engineering treatises will not be too critical in this regard. In explaining the plan the author states "It is not exhaustive, neither does it touch many of the secondary topics that might be discussed in connection with the various subjects. It does, however, describe at least one representative piece of each type of household apparatus that is used in good practice."

The emphasis placed upon gas appliances for isolated homes as compared with those for the city gas supply renders that treatment more applicable to rural localities. More attention might be given to recent improvements in lighting and electrical appliances for the home. At the present time the gas engine and the automobile appear to be more important as household necessities than the gasoline gas generator. The chapters on water-supply, plumbing, and sewage disposal are very satisfactory as types of clear and illuminating treatment. This book is a welcome pioneer in its field and it deserves an extensive use in household physics classes as well as among intelligent housekeepers generally.

F. F. GOOD,
Teachers College, Columbia University.

The Cost of Food. By ELLEN H. RICHARDS, Third edition, revised under the direction of John F. Norton. New York: John Wiley and Sons, 1917, pp. 137. $1.00. By mail of the Journal, $1.10.

All admirers of Mrs. Ellen H. Richards—and who of us does not classify under that head?—will be delighted to have one of her books restored to usefulness. Of the four books on cost:—Cost of Shelter, Cost of Clothing, Cost of Living, and Cost of Food, the last was the one most out of date. Although other prices have changed too, none other has risen to the extent that the price of food has advanced. While at present even magazine literature can hardly keep pace with our changing conditions, this revision uses prices recent enough to have meaning for us.

Professor Norton has worked very skillfully in his revision. The text itself has been left almost unchanged except for the necessary changes in figures. Looking it over, one realizes, perhaps as never before, how far-seeing Mrs. Richards was in her general statements. At the end of the book, two chapters have been omitted,—one of the Dietary Computator from which Mrs. Richards hoped much but which in practice proved cumbersome, and one on Diet for Incipient Tuberculosis.

The changes in this edition include statements in regard to vitamines, the correction of percentages in food analysis as a result of more recent experiments, the new standard of calorie requirement for children, menus and valuable data on cost more up-to-date than that in the old volume, and, of course, references to modern authorities, and an excellent bibliography.

Material adding greatly to the value of the book is found in such suggestive menus as the "Penny" luncheons on pp. 30–31, in Gephart's study of what boys ate in a boarding school on pp. 41–42, the Budget Allowance for Food in Public Institutions in New York, in 1915, on p. 65, Luncheons costing 10 cents a person prepared by school children, pp. 89–90, Menus for Families of Moderate Means, pp. 103–105, the Hundred Calorie Portion table, p. 123, and the grouping of costs of food pp. 124–125.

On page 57 the statement that 25 per cent of the family income is sufficient for food, is allowed to stand unchanged—perhaps because the sentence begins "I have elsewhere estimated that;" but it is certainly misleading. On page 60, Dr. Norton has changed the meaning of one of Mrs. Richards' sentences slightly by giving the "mean" as 16. Mrs. Richards' figure was intended to be a "mean" between the cost for "those of whom the world has nothing more to hope" and the children; not the mean of the two groups of children. However, the error is insignificant.

MABEL T. WELLMAN,
Indiana University.

War-time Breads and Cakes. By AMY L. HANDY. Boston: Houghton, Mifflin Co., 1918, pp. 66. $.75.

This is a small book containing recipes for "war breads and cakes" which the author gives as the result of her own experiments in the use of wheat substitutes. In a majority of the recipes whole wheat flour is the principal substitute used although there are a large number in which cornmeal, oatmeal, rice, rye flour, mashed potatoes, and squash take the place of part or all of the wheat flour. The book is probably most valuable to the housewife in that it suggests how she may modify her own recipes.

ELIZABETH W. MILLER,
University of Chicago.

The Belgian Cook-Book. Edited by Mrs. Brian Luck. New York: E. P. Dutton & Co., 1915, pp. 151. $1.00.

The Belgian Cook-Book containing recipes and delightfully different things suggested by the Belgian refugees in England, shows that not to the French alone belongs the reputation of cooking economically, originally, and deliciously.

The recipes are unusual without being too much trouble to prepare. Cooked Lettuce, Apples and Sausages, Saffron Rice, Hawthorn Cordial, Fish and Custard, Yellow Plums and Rice, Strawberry Fancy, Military Prunes, Quince Custard—are a few of the dishes given.

FLORA G. ORR.

BOOKS RECEIVED

Camp Cookery. Ava B. Milam, A. Grace Johnson, and Ruth McNary Smith. Portland, Oregon: The J. K. Gill Company, 1918, pp. 108. $.50.

Caroline King's Cook Book. Caroline B. King. Boston: Little, Brown & Company, 1918, pp. 275. $1.50.

Coöperation, the Hope of the Consumer. Emerson P. Harris. New York: The Macmillan Company, 1918, pp. 328. $2.00.

Everywoman's Canning Book. Mary B. Hughes. Boston: Whitcomb and Barrows, 1918, pp. 96. $.75.

Food Preparation. Beth Warner Josserand. Peoria, Ill.: The Manual Arts Press, 1917, pp. (Part I) 148, (Part II) 142. $1.25 each.

Social Control. Volume XII of the Publications of the American Sociological Society. Univ. of Chicago Press.

Three Acres and Liberty. Bolton Hall. New York: The Macmillan Company, 1918, pp, 276. $1.25.

PAMPHLETS RECEIVED

Issued by the United States Department of Agriculture:

Circulars from the office of the Secretary in regard to the Supply of: *No. 96, Sugar; No. 97, Lard; No. 98, Canned Salmon; No. 99, Miscellaneous Cereal and Vegetable Foodstuffs; No. 100, Wheat and Flour; No. 101, Miscellaneous Animal Food Products. Also circular No. 106, Use Potatoes to Save Wheat.*

Control of Diseases and Insect Enemies of the Home Vegetable Garden. W. A. Orton and F. H. Chittenden. Farmers' Bulletin No. 856.

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NEWS FROM THE FIELD

The National Society for Vocational Education, formerly the National Society for the promotion of Industrial Education, met in Philadelphia February 21 to 23. The program centered around four main topics, (1) Education for War Industries, (2) Administration of the Smith-Hughes Act, (3) Training and Employment of Women, and (4) Rehabilitation of the Disabled.

Under "Education for War Industries," representatives from the Pennsylvania Department of Labor, the Emergency Fleet Corporation, the Bethlehem Steel Company, and the Federal Board for Vocational Education outlined methods for securing and training employees for farm and factory to meet the demands of the present emergency.

An afternoon and evening were devoted to discussion of the problems of administration under the Smith-Hughes Act, the necessity for coördinating the new educational machinery created by that act, and the training of teachers to develop it. Mr. J. P. Munroe reviewed the provisions of the act, and the difficulties encountered by the Federal board in interpreting it. He emphasized the fact that, according to the law, the training must be for wage earning, but that the aim is to make it as broad as possible and not merely utilitarian. Mr. L. S. Hawkins, also of the Federal Board for Vocational Education, called attention to the necessity for professional, technical, and practical experience on the part of teachers, and to the need for an adequate system of practice teaching.

In discussing "Women in Industry," Mrs. A. L. Burdick gave four essential characteristics of an occupation for which training might be offered to women: "(1) It must have teachable content, i.e., it must not be 'a job which just anybody can do', it must take an appreciable time to learn, and it must have a definite body of knowledge and a progression in its precesses. (2) It should not be highly seasonal. (3) It should offer prospects for wage advancement. (4) The occupation must be able to absorb a sufficient number of workers so that training does not overstock the market."

Mrs. Hilda Mulhauser Richards, of the Federal Employment Service, emphasized the fact that there is no shortage of male labor and consequently no reason why women should be hurried into industries in which the work is much better suited to men.

One session was devoted to a discussion of the rehabilitation of disabled soldiers.

Alabama Home Economics Association. On February 1–2 the fourth annual conference met in Montevallo, with Miss May Hansis presiding. The program centered about the stirring events of the day as they affect home economics. The noteworthy addresses were those by Miss Anna E. Richardson, of the Federal Board for Vocational Education, Washington, D. C., and Mr. Robert H. Mangum, Federal Food Administrator, Montgomery, Ala. Prominent club women and home makers, as well as teachers, were in attendance.

At the annual meeting of the Alabama Educational Association, in Birmingham, March 29, the Home Economics Section met at noon for a joint luncheon with the Industrial Arts Section. Among the guests and speakers at this time were Miss Julia Lathrop, National Director of Child Welfare, and Dr. L. S. Hawkins of the Federal Board for Vocational Education. In the afternoon the Home Economics Association convened for a program and business meeting. About fifty were present and a most enthusiastic meeting resulted.

The New England Home Economics Association, Mrs. Schuyler F. Herron, President, has held five meetings during the last year. In October, Miss Arnold extended greetings, Miss Gunderson of Amherst spoke on Extension Work, and Dr. Graham Lusk on Calories in Common Life. Exhibits prepared by the Women's Municipal League, Food Facts Bureau, were shown and explained by Miss Blood. Miss Guerrier of the United States Food Administration, told of food conservation work through libraries, and Miss Morris, of food conservation in Boston Schools. Miss Roof and Miss Pulsifer explained the work of the city leader, while Miss Goodrich discussed food conservation in institutions, and Mrs. Cannon, practical conservation in the home.

The November meeting included a report, by Mr. Davis, of investigation among the poor, and an "experience meeting" followed, with reports from various agencies.

In December, Professor Carver of Harvard spoke on Economics of the Food Supply, Mt. Bullard, on Changes in Food Production, and Miss Arnold, on Coöperation with Washington.

The February topics were Clothing and the War, by Mrs. Woolman, Fuel and the War, presented by Mr. Loring, and Food and the War, by Mrs. Donald.

In March, Dr. McCollum spoke on Milk as a Protective Food.

Ellen H. Richards Fund Over $5000. The Trustees of the Richards Fund received contributions so that $450 was invested in Liberty Bonds of the third issue, thus bringing the total amount of the Fund to over $5000. The banner contribution was one of over $82 from the home economics students of the Iowa State College at Ames who gave a play and devoted the proceeds to the Richards Fund. Local home economics associations and departments of home economics are asked to begin plans for contributions to the Fourth Liberty Loan, which it is expected will come early in the fall. The Richards Fund supports next year a graduate fellowship in the University of Chicago, worth $500 and tuition.

The State Normal School for Women at Harrisonburg, Va., has rented a house adjoining the campus and fitted it up as a practice house for the household arts seniors. Six of them occupy the house each quarter and take turns in the various activities of housekeeping. Eighteen dollars apiece per month are allowed them for all running expenses. Mrs. Moody, of the Household Arts Department, has the supervision of this work, and her little boy affords the girls practice in child feeding.

A number of new courses were offered for the spring quarter in order to meet the request of the United States Food Administrator that as many as possible of our students be prepared for special service in food conservation during the summer. A special course in canning was given every student in the school during the daily assembly period by adding twenty minutes to the period and beginning classes earlier in the morning.

The cooking classes have been learning to make "war breads" and other dishes recommended by the government, and the sewing classes have made 150 garments for the Red Cross.

Notes. Dr. Jessica Peixotto has been made Executive Chairman of the department of Child Welfare, of the Woman's Committee, Council of National Defense. Dr. Peixotto has obtained leave of absence from the University of California, where she holds the chair of social economics.

Salem Academy and College, Winston-Salem, N. C., has this year granted the degree of B.S. to students completing the four-year college course in home economics.

A request for an exchange of postage stamps has come from Switzerland. Will any who are interested write Mlle. Siebert, rue de la Prèfecture, Fribourg.